



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(22) International Filing Date: <b>24 January 1992 (24.01.92)</b>			(74) Agent: <b>BELCHER, Simon, James; Urquhart-Dykes &amp; Lord, Tower House, Merrion Way, Leeds, West Yorkshire LS2 8PA (GB).</b>
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<p>(71) Applicant (for all designated States except US): <b>THE BOC GROUP PLC [GB/GB]; Chertsey Road, Windlesham, Surrey GU20 6HJ (GB).</b></p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only) : <b>BRAATZ, Robert, Edwin [US/US]; 414 Woodview Drive, Sun Prairie, WI 53590 (US). GREGORY, Raymond, Stanley [GB/GB]; 1 Langley Grove, Bingley, West Yorkshire BD16 4ES (GB). HEATON, Robert, Anthony [GB/GB]; 101 Hurrs Road, Skipton, North Yorkshire BD23 2JF (GB). WHITAKER, Keith [GB/GB]; 3 Hall Court, Sutton-in-Craven, Keighley, West Yorkshire BD20 7NF (GB). SAMPSON, David, Charles [GB/GB]; 32 Bannister Walk, Cowling, West Yorkshire BD22 0NU (GB).</b></p>			Published <i>With international search report.</i>
<p>(54) Title: <b>A CONTAINER FOR LIQUID ANAESTHETIC AGENT</b></p> <p>(57) Abstract</p> <p>A container (2) for a liquid anaesthetic agent for supplying the agent to an anaesthetic vaporiser comprises a reservoir for the liquid agent, a valve (6) which, when closed, prevents the flow of the liquid agent from the reservoir, a tubular outlet (10) through which the liquid can leave the reservoir when the valve is open. An O-ring (20) at the free end of the conduit provides a sealing surface for forming a seal with a corresponding sealing surface provided at an inlet to a vaporiser to which the anaesthetic agent is to be supplied. A flange (22) engages a guide on the vaporiser, to retain the container in contact with the vaporiser.</p>			

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## A CONTAINER FOR LIQUID ANAESTHETIC AGENT

This invention relates to a container for a liquid anaesthetic agent, for supplying the agent to a sump of an anaesthetic vaporiser, and to techniques for refilling the sump using the container.

An anaesthetic agent is administered to a patient during anaesthesia by means of an anaesthetic vaporiser. The agent is supplied to the patient from a sump within the vaporiser as a vapour, the agent being stored in the sump as a liquid.

Systems for filling the sump of an anaesthetic vaporiser with anaesthetic agent are disclosed in GB-1193241 and GB-1394216. These systems include a bottle in which the agent is supplied to the operator of the vaporiser, and a flexible conduit which can be mounted on the bottle opening by the operator, through which the agent passes from the bottle into the vaporiser.

Known filling systems have the disadvantage that anaesthetic agent can escape from the bottle after the bottle has been opened and before the conduit is positioned on the bottle opening. This disadvantage is becoming of increasing significance as attention is given to the conditions to which medical workers are exposed during their work.

The present invention provides a container for a liquid anaesthetic agent which includes means for preventing loss of anaesthetic agent from the container.

In one aspect, the invention provides a container for a liquid anaesthetic agent for supplying the agent to an anaesthetic vaporiser, the container comprising:

- (a) a reservoir for the liquid agent;
- (b) a valve which, when closed, prevents the flow of

-2-

the liquid agent from the reservoir;

(c) a tubular outlet through which the liquid can leave the reservoir when the valve is open; and

(d) a sealing surface provided towards the free end of the outlet extending around the perimeter thereof, for forming a seal with a corresponding sealing surface provided at an inlet to a vaporiser to which the anaesthetic agent is to be supplied.

The present invention has the advantage that it makes it possible for anaesthetic agent to be sealed in a container under controlled conditions, generally at a location remote from that at which the agent is to be administered to a patient, for example at the site at which the agent is manufactured. The agent is then able to remain in the container, and need not be exposed to atmosphere, at any time prior to administration to a patient. This allows the particular problem of the effect of anaesthetic agents on operators of anaesthetic vaporiser equipment, and on other medical workers, arising from escaping agent at the time of supply of the agent to a vaporiser to be solved.

The container of the present invention finds application in the supply of anaesthetic agents such as 2-chloro-1,1,2-trifluoromethyl difluoromethyl ether (sold under the trade marks Enflurane and Ethrane), 1-bromo-1-chloro-2,2,2-trifluoroethane (Halothane and Fluothane), 1-chloro-2,2,2-trifluoroethyl difluoromethyl ether (Isoflurane and Forane) and fluoromethyl 2,2,2-trifluoro-1-(trifluoromethyl)ethyl ether (Sevoflurane). The technique of the invention is particularly well suited to the supply of volatile anaesthetic agents, for example agents having a boiling points not more than about 5°C above ambient temperature. An example of an agent which can be volatile under certain conditions is 2-(difluoromethoxy)-1,1,1,2-tetrafluoroethane (sold under the trade marks Desflurane and

-3-

Suprane). The problem of an anaesthetic agent escaping from a container while it is being supplied to a vaporiser is particularly severe in the case of a volatile agent since, under relatively high temperature conditions (that is at temperatures around or above the boiling point of the agent), the agent within the reservoir in the container can be at elevated pressure. Furthermore, anaesthetic agent contained within the sump of a vaporiser can be at elevated pressure, for similar reasons. The refilling technique made possible by the container of the present invention allows an anaesthetic agent at elevated pressure within a container to be supplied to the sump of an anaesthetic vaporiser, containing the agent also at elevated pressure, and to do so without leakage of the agent.

Preferably, the container includes means for forming a connection between the container and a vaporiser to retain the container on the vaporiser. This can allow the seal between the container and the vaporiser to withstand pressure within either or both of them, to which the seal is exposed when fluid is able to pass between them.

Preferably, the means for connecting the container to the vaporiser comprises a formation which presents a surface facing in a direction substantially opposite to the direction in which fluid passes out of the reservoir through the outlet. The surface may be provided by, for example, a flange, or one or more recesses. Preferably, the surface extends around the entire perimeter of the container, so that the connection means is able to function irrespective of the rotational orientation of the container.

The outlet may be arranged to receive a conduit, for example one which is mounted on an anaesthetic vaporiser, through which the anaesthetic agent can flow from the reservoir to the sump in the vaporiser. In many circumstances, however, it is preferred that the outlet includes a conduit which extends from the reservoir, to engage, for example to be received in, an

-4-

inlet on a vaporiser to provide a channel through which fluid flows from the reservoir into the sump of a vaporiser. This arrangement has the advantage that the conduit does not remain on the vaporiser, where it might be liable to physical damage.

It is generally preferred that a conduit provided as part of the container is rigid so that it can withstand compression loads longitudinally, for example that it be made from a relatively undefeatable material.

The sealing surface on the conduit will be provided of a material and with a suitable configuration to form a seal to the corresponding sealing surface on an inlet to an anaesthetic vaporiser. Examples of suitable sealing arrangements include ones provided by a deformable O-ring which engages a surface, for example a surface of a cylindrical body, which may be an external or internal (in which case the body will be tubular) surface.

Preferably, the valve comprises a plate member and an aperture against which the plate member is forced to close the aperture against fluid flow through it, the plate member being forced away from the aperture when a seal is made between the container and a sump of a vaporiser.

The container may include an insert extending from the plate member, through which force can be applied to the plate member to urge it away from the aperture to open the valve. The insert and the plate member may be provided as an integral part, for example as a result of a moulding operation. The insert may define a plurality of chambers in the tubular outlet, for flow of liquid anaesthetic agent from the reservoir, and for return flow of anaesthetic agent vapour into the reservoir, respectively. The chambers may be coaxial. In another arrangement, the chambers may be defined by one or more partitions which extend across the tube of the outlet, for example by means of two partitions which extend across the

-5-

conduit approximately perpendicularly to one another to define four chambers.

The valve and the outlet, with an outlet conduit if present, may be attached to the reservoir by a technique which seals the attachment to prevent interference therewith. For example, they may be attached by crimping, or by means of a screw threaded connection which might be sealed for example by means of a plastic film which is caused to shrink onto the connection by the application thereto of heat. The use of a permanent attachment technique has the advantage that it is possible to detect interference with the seal to the reservoir, which might be associated with for example contamination of the anaesthetic agent contained within it.

The anaesthetic vaporiser to which anaesthetic agent might be supplied from the container of the present invention will generally have at least one valve which, when closed, prevents passage of fluid into and out of the sump. It will be preferred at least for the sump to have a valve associated with the inlet, which engages the outlet from the container when the a seal between the two is formed. That valve may comprise a plate member and an aperture against which the plate member is forced to close the aperture against fluid flow through it, the plate member being forced away from the aperture when a seal is made between the container and the sump. This valve, like the valve on the container, may be opened by means of an insert extending from the plate member, through which force can be applied to the plate member to urge it away from the aperture to open the valve. When there are plate members in the valves on the container and the sump, and both of the plate members are to be moved by means of an insert, they may be moved by a single insert, or by a pair of inserts, each associated with a respective one of the plate members, which act against one another to cause the plate members to move and to open the valves.

-13-

6. A container as claimed in claim 5, in which the conduit is rigid.

7. A container as claimed in claim 5 or claim 6, in which the sealing surface is provided on an outer surface of the conduit.

8. A container as claimed in any one of claims 1 to 7, in which the sealing surface is provided by a deformable O-ring.

9. A container as claimed in any one of claims 1 to 8, in which the valve comprises a plate member and an aperture against which the plate member is forced to close the aperture against fluid flow through it, the plate member being forced away from the aperture when a seal is made between the container and the sump.

10. A container as claimed in claim 9, which includes an insert extending from the plate member, through which force can be applied to the plate member to urge it away from the aperture to open the valve.

11. A container as claimed in claim 10, in which the insert defines a plurality of chambers in the tubular outlet, for flow of liquid anaesthetic agent from the reservoir, and for return flow of anaesthetic agent vapour into the reservoir, respectively.

12. A container as claimed in claim 13, in which the said chambers are coaxial.

13. A container as claimed in any one of claims 1 to 12, which includes a cap which can be applied to the outlet from the reservoir to close the outlet.

14. A container as claimed in any one of claims 1 to 13, which includes a quantity of an anaesthetic agent contained in the reservoir.

-1/5-

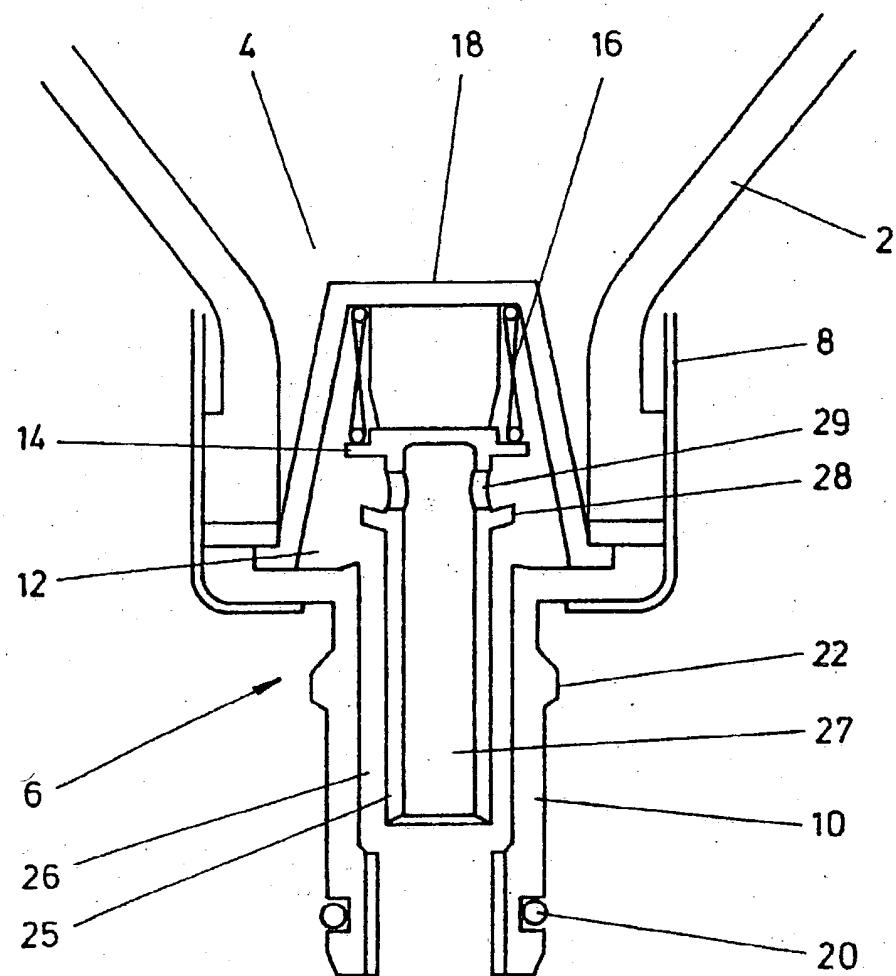


FIG. 1

**SUBSTITUTE SHEET**

-2/5-

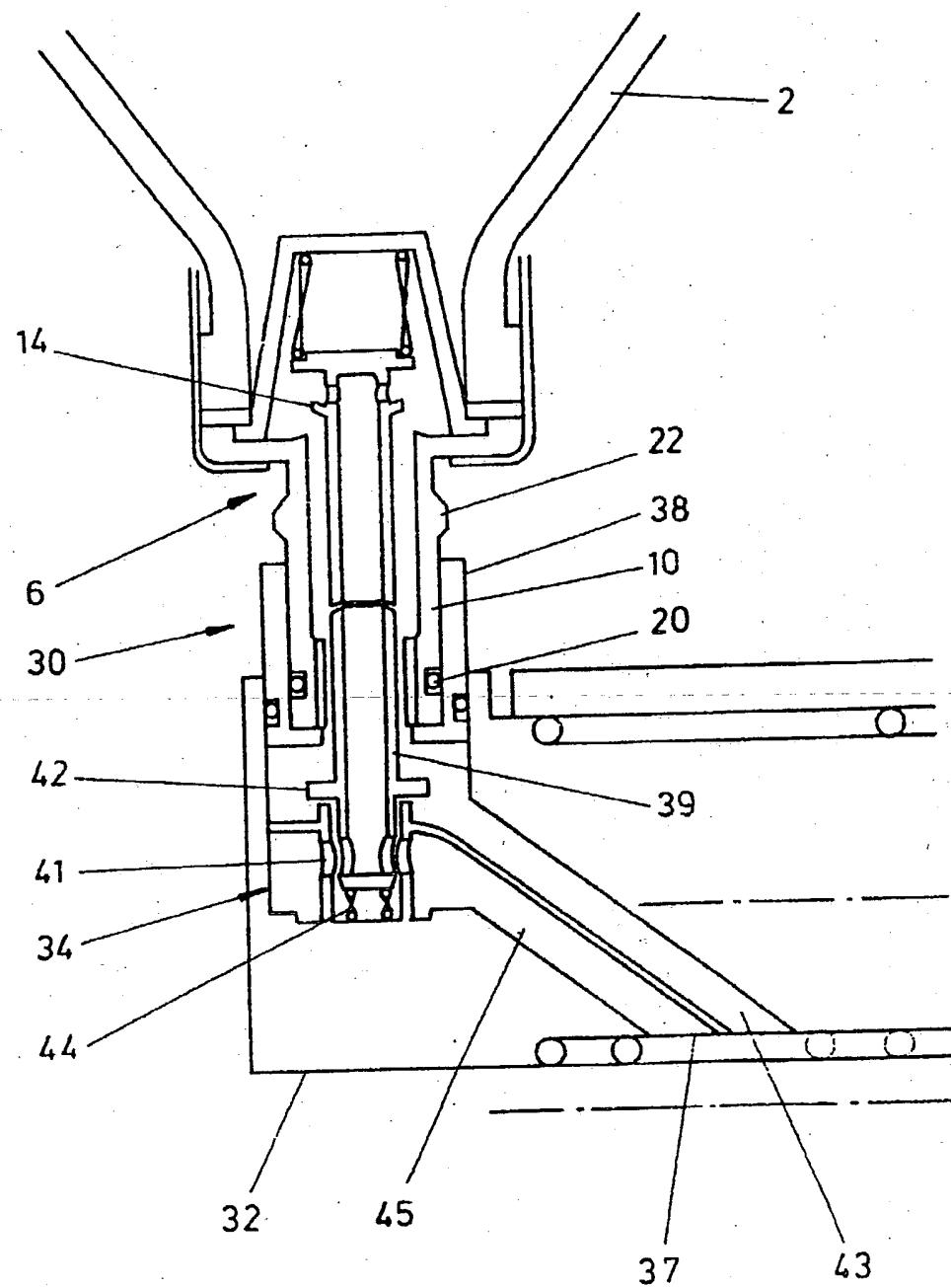


FIG. 2

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- 3/5 -

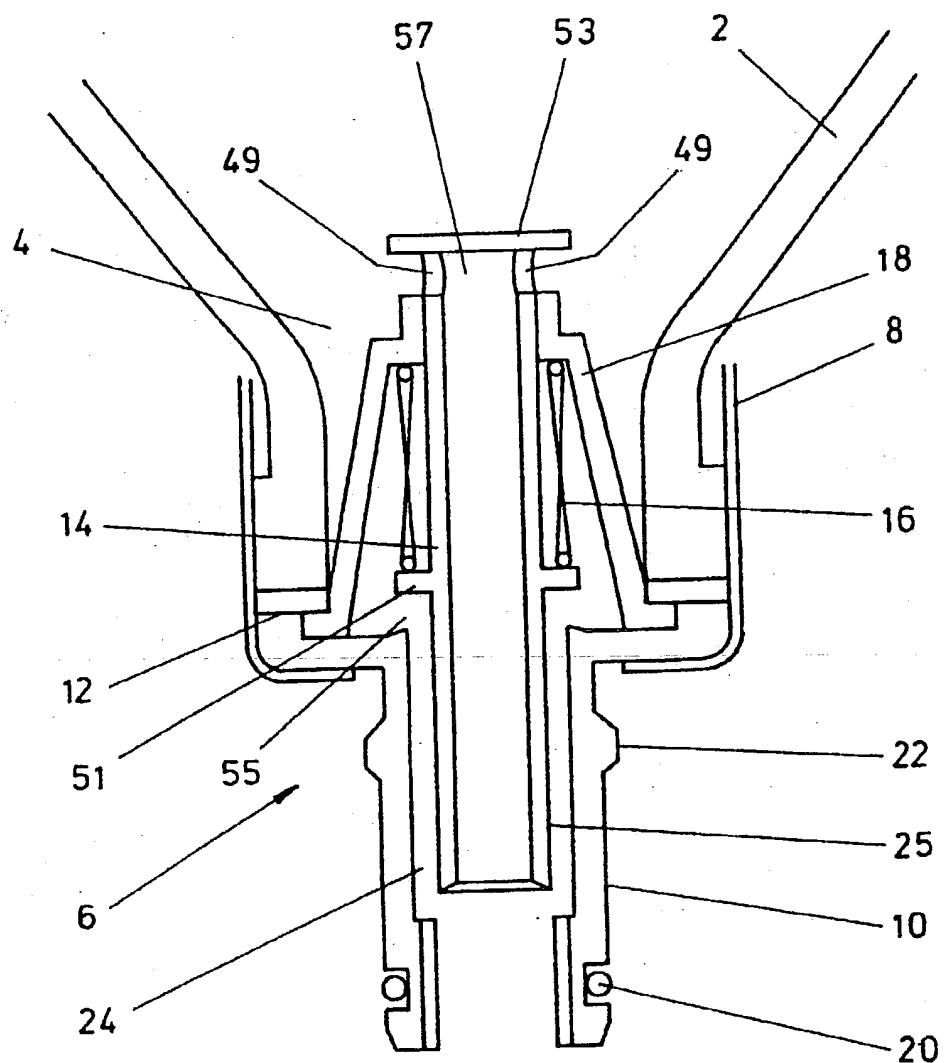


FIG. 3

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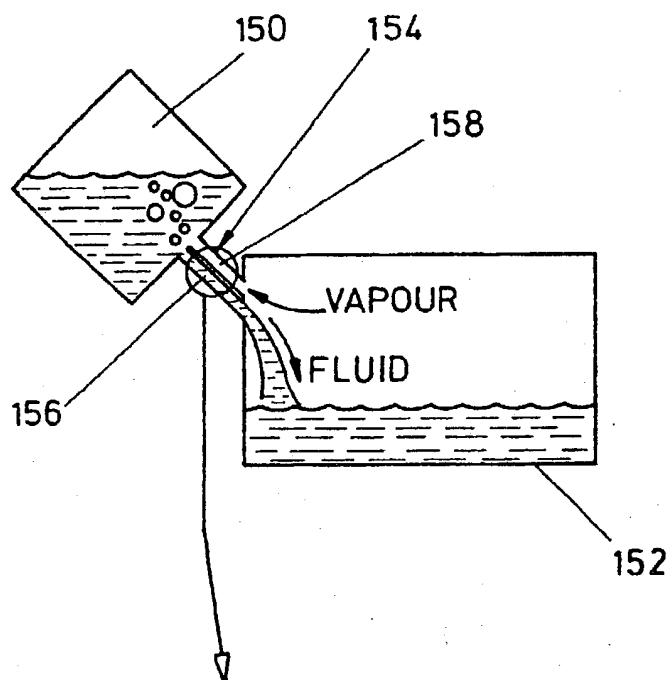


FIG. 4A

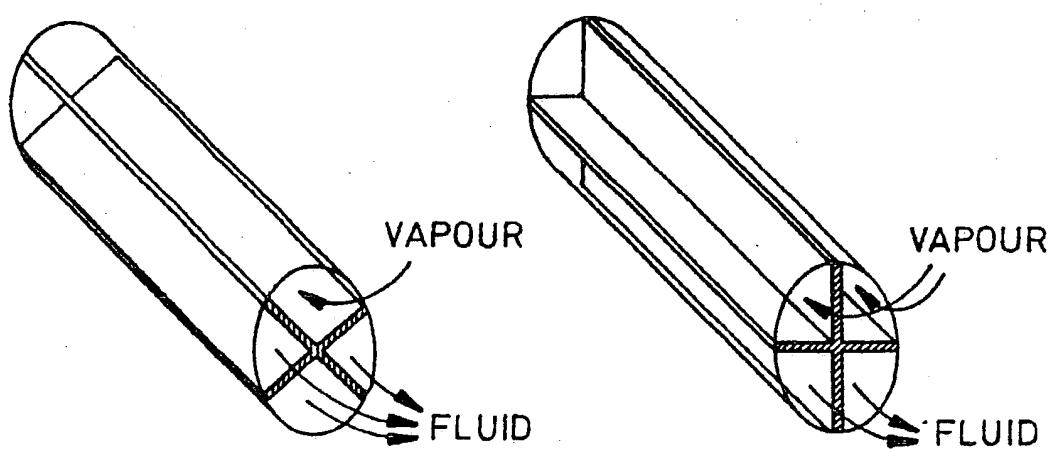


FIG. 4B

FIG. 4C

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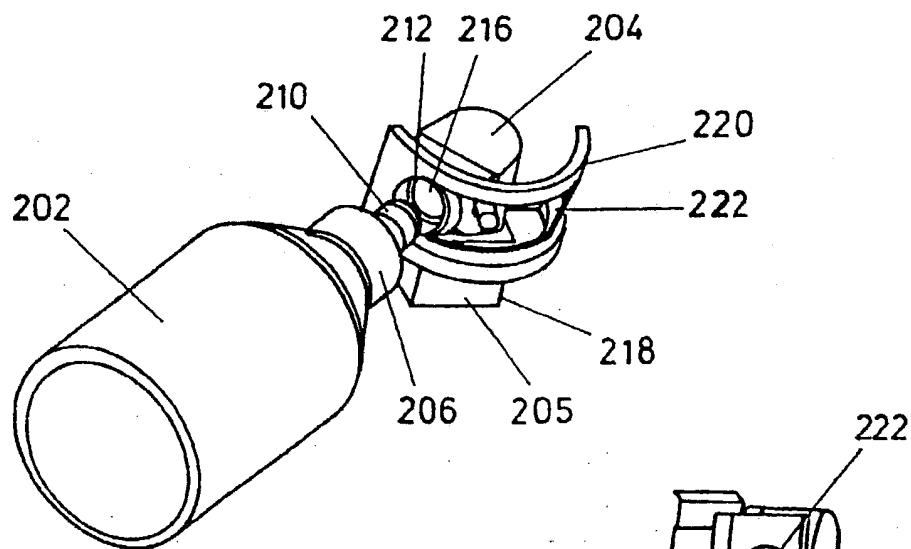


FIG. 5A

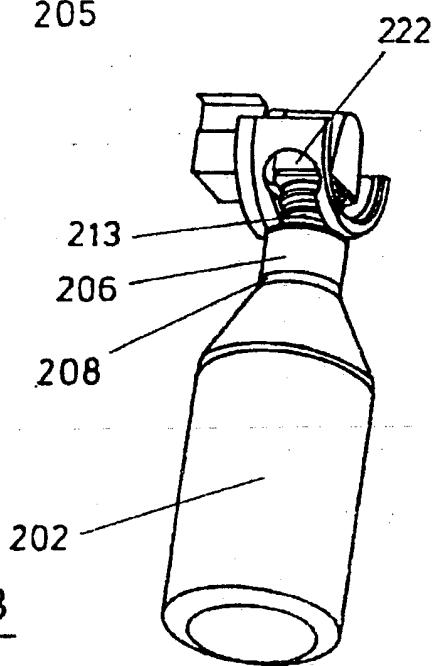


FIG. 5B

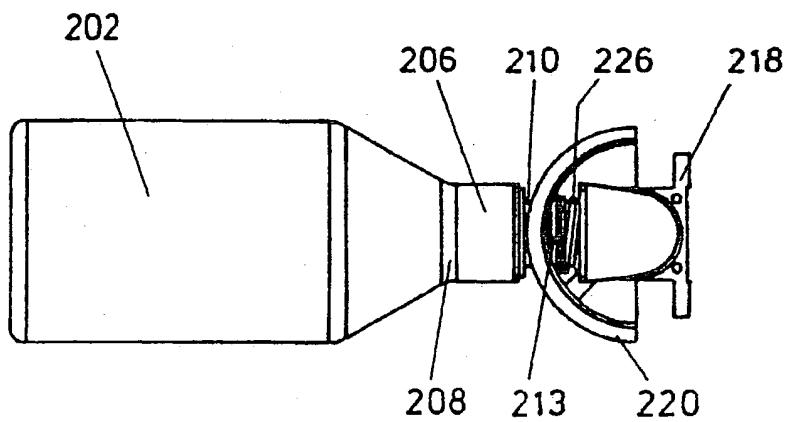


FIG. 5C **SUBSTITUTE SHEET**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) <sup>6</sup>							
According to International Patent Classification (IPC) or to both National Classification and IPC Int.C1. 5 A61M16/18; B67D5/02							
II. FIELDS SEARCHED							
<table border="1"> <thead> <tr> <th colspan="2">Minimum Documentation Searched<sup>7</sup></th> </tr> <tr> <th>Classification System</th> <th>Classification Symbols</th> </tr> </thead> <tbody> <tr> <td>Int.C1. 5</td> <td>A61M ; B67D</td> </tr> </tbody> </table>		Minimum Documentation Searched <sup>7</sup>		Classification System	Classification Symbols	Int.C1. 5	A61M ; B67D
Minimum Documentation Searched <sup>7</sup>							
Classification System	Classification Symbols						
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Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>							
III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup>							
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No <sup>13</sup>					
Y	EP,A,0 295 671 (DRÄGERWERK AKTIENGESELLSCHAFT) 21 December 1988 see abstract; figures ---	1-14					
Y	DE,U,8 429 005 (SCHRÖDER) 11 April 1985 see page 4, line 30 - page 5, line 34; claim 1; figures ---	1-14					
A	EP,A,0 242 979 (THE BOC GROUP PLC) 28 October 1987 see abstract; figures ---	1,13					
A	WO,A,9 015 951 (SONOCO LIMITED) 27 December 1990 see abstract; figures ---	9-11 -/-					
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IV. CERTIFICATION							
Date of the Actual Completion of the International Search 1 05 MARCH 1992		Date of Mailing of this International Search Report 12.03.92					
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
P,A	EP,A,0 467 068 (DRÄGERWERK AKTIENGESELLSCHAFT) 22 January 1992 see abstract; figures	1

**ANNEX TO THE INTERNATIONAL SEARCH REPORT**  
**ON INTERNATIONAL PATENT APPLICATION NO. GB 9200139**  
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0295671	21-12-88	DE-A-	3720326	29-12-88
		JP-A-	1119265	11-05-89
		US-A-	4867212	19-09-89
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